OPERATION
AND
SERVICE MANUAL
T.O.S. NO. 143

GENERAL ELECTRIC CO.
Instrumentation & Control
228 W. Florence Ave.
Inglewood, Calif. 90301

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MODEL CDH-0.1
PLUG-IN HARMONIC MARKER

Telonic INSTRUMENTS
Division of Telonic Industries, Inc.

WARRANTY

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INSTRUMENTS; Division of Telonic Industries, Inc. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble, plus the MODEL AND SERIAL NUMBERS of the unit should be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not.

SERIAL NO.

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CDH-0.1

HARMONIC MARKER

SECTION I

GENERAL INFORMATION

1-1. SPECIFICATIONS

1.2. Table 1-1. lists the specifications for the CDH-0.1 HARMONIC MARKER.

TABLE 1-1.

Specifications	
Crystal Accuracy	±0.005%
Frequency Range	0.1 to 100 MHz
Marker Width	The width of the markers depends on the marker amplifier circuitry in the sweep generator and is adjustable at the MARKER SHAPER Control on the front panel on most instruments.
Marker Amplitude and Signal to Noise Ratio	The amplitude and signal to noise ratio of the markers also depend on the sweep generator. With a typical Telonic Sweep Generator, a clear marker will be produced by these units over the entire specified frequency range. A clear marker is considered to be one with at least 0.2V peak to peak amplitude and a signal to noise ratio of at least 10 to 1.
Voltage Requirements	B+ 105V at 18mA Filaments 6.3V at 1200mA

1-3. DESCRIPTION

1-4. The Telonic CDH HARMONIC MARKERS are crystal-controlled plug-in units that produce birdy-type markers at the fundamental and all harmonic frequencies over the entire specified frequency range. The marker frequency in megahertz can be identified by the numerals following the letters CDH.

1-5. This unit consists of a Colpitts oscillator with a crystal providing feedback at the series resonant frequency. The oscillator is followed by three harmonic generating stages. The output from the harmonic generator is fed to a dual mixer where it is combined with the sweep sample signal. The resultant heterodyned signals or "beats" are then amplified in a video amplifier stage and fed through a low-pass filter to the Birdy-By-Pass amplifier in the sweep generator. The unit will provide strong harmonics from 100 kHz to over 100 MHz.

1-6. The crystals used in this unit are manufactured specifically for the associated oscillator circuitry. Proper allowance has been made for the capacitance of the crystal holders and other reactive properties of the oscillator section.

SECTION II

INSTALLATION

2-1. GENERAL

2-2. This plug-in unit can be inserted in any two of the eight plug-in sockets, built in on all Telonic Sweep Generators, that will provide a termination for the sweep sample input and output connections. The sweep sample input (BNC jack) can be fed from either one of two sweep sample lines in the sweep generator or from the sweep sample output of an adjacent plug-in unit. The sweep sample output (BNC plug) should be connected to either one of the two BNC terminators on the chassis or the sweep sample input of an adjacent box, to provide a 50 ohm matched termination.

SECTION III

ADJUSTMENT

3-1. GENERAL (Refer to Figure 1)

3-2. A test point is provided for easy adjustment of this circuit. The adjustment should be made to secure near maximum negative voltage at this test point. The optimum point is just slightly off the peak on the low inductance side, this results in a crystal tolerance of better than 0.005%. For greater accuracy, the output from the test point can be fed to a counter or other frequency measuring device.

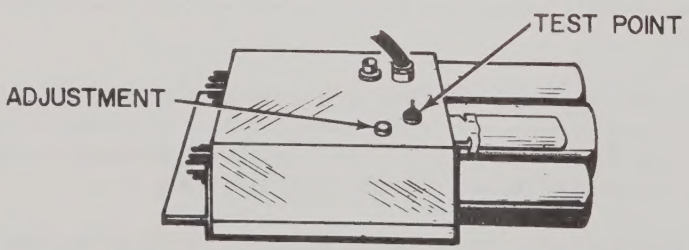


Figure 1. Adjustment

SECTION IV

MAINTENANCE

4-1. GENERAL

4-2. Maintenance of the CDH-0.1 HARMONIC MARKER will normally be limited to readjustment and replacement of component parts worn out in normal use or damaged by overload, accident, etc.

4-3. If readjustment fails to correct a trouble, the malfunction can usually be traced to a defective tube or diode. Weak harmonic output and noise are symptoms usually indicative of a defective diode. The replacement diode should have high rectification efficiency if optimum results are to be realized.

4-4. In the event replacement of a crystal is necessary, it is strongly recommended that the replacement be ordered from Telonic Industries, Inc. Specified accuracy may not be realized with crystals from other sources.

4-5. TROUBLESHOOTING (Refer to Figure 2)

4-6. Ensure that the Sweep Generator is operating properly before starting troubleshooting procedure.

4-7. Figure 3 provides typical waveforms present at the various test points indicated on the schematic diagram.

4-8. Adjust the Sweep Generator controls as follows:

a. SWEEP RATE - LINE

b. SWEEP WIDTH - 600 KHz

c. MONITOR - RF 1

d. LEVEL - Adjust for 1V output

e. RF FUNCTION - SWEEP

f. 0.1 MARKER SWITCH - ON

g. POWER SWITCH - ON

h. SWEEP RATIO - EQUAL

i. PLUG-IN SWEEP GENERATOR FREQUENCY - 1 MHz

NOTE

The Telonic L-2M Plug-in Sweep Generator was used to obtain the indicated waveforms.

4-9. Adjust oscilloscope as indicated under the waveform.

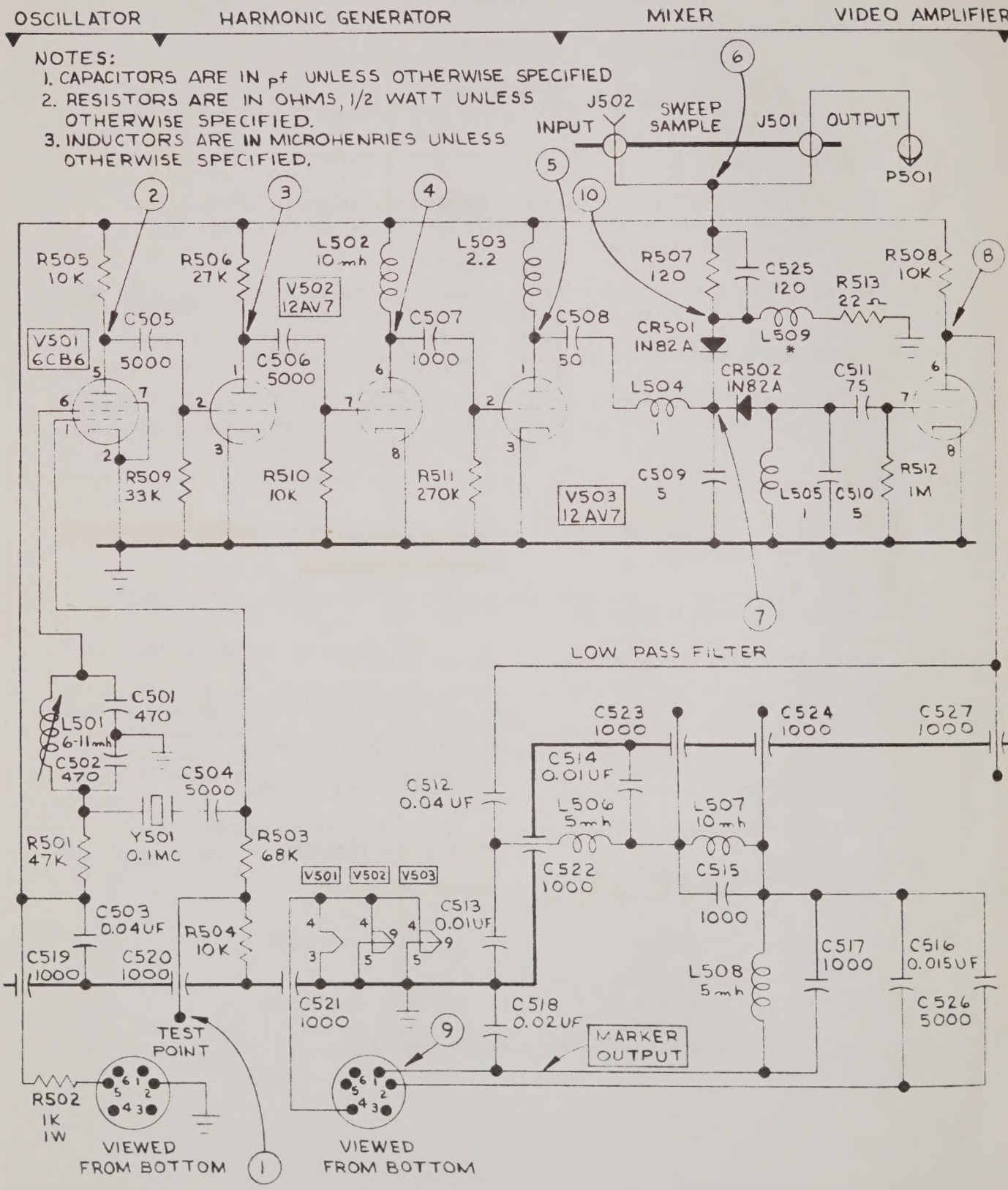
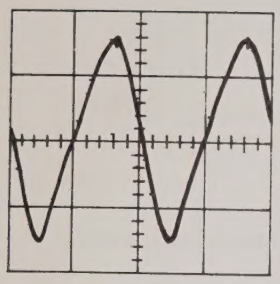
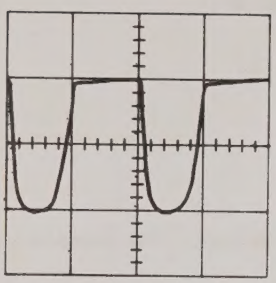


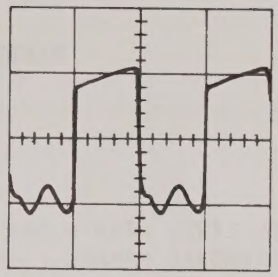
Figure 2. Schematic



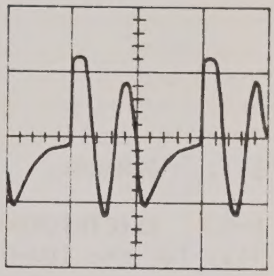
TEST POINT 1
Scale Level -3.5V
Vert. Sensitivity
.005V/cm
Horizontal Sweep
5 μsec/cm
Trigger - internal



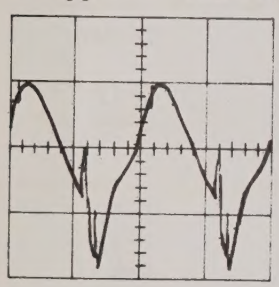
TEST POINT 2
Scale Level +60V
Vert. Sensitivity
2V/cm
Horizontal Sweep
5 μsec/cm
Trigger - internal



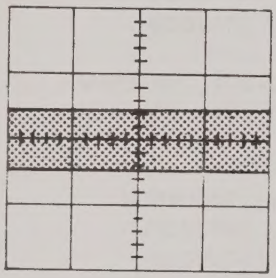
TEST POINT 3
Scale Level +32V
Vert. Sensitivity
1V/cm
Horizontal Sweep
5 μsec/cm
Trigger - internal



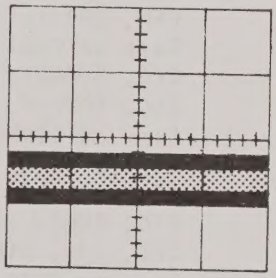
TEST POINT 4
Scale Level +90V
Vert. Sensitivity
10V/cm
Horizontal Sweep
5 μsec/cm
Trigger - internal



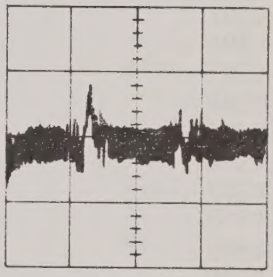
TEST POINT 5
Scale Level +90V
Vert. Sensitivity
.05V/cm
Horizontal Sweep
5 μsec/cm
Trigger - internal



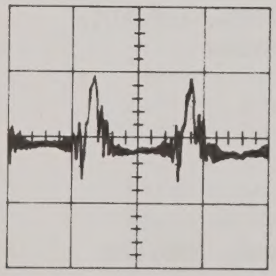
TEST POINT 6
Scale Level 0V
Vert. Sensitivity
.02V/cm
Horizontal Sweep
1 msec/cm
Trigger - line



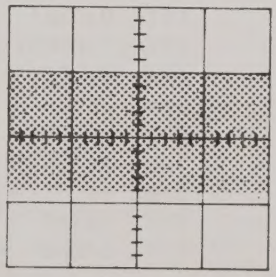
TEST POINT 7
Scale Level 0V
Vert. Sensitivity
.2V/cm
Horizontal Sweep
1 msec/cm
Trigger - line



TEST POINT 8
Scale Level +60V
Vert. Sensitivity
.02V/cm
Horizontal Sweep
1 msec/cm
Trigger - line



TEST POINT 9
Scale Level 0V
Vert. Sensitivity
.01V/cm
Horizontal Sweep
1 msec/cm
Trigger - line



TEST POINT 10
Scale Level 0V
Vert. Sensitivity
.01V/cm
Horizontal Sweep
1 msec/cm
Trigger - line

Figure 3. Waveforms

SECTION V

PARTS LIST

5-1. GENERAL.

5-2. ELECTRICAL PARTS LIST. Table 5-1 provides the complete electrical parts list for the CDH-0.1 HARMONIC MARKER.

TABLE 5-1

Electrical Parts List

Circuit Reference	Description	Telonic Part No.
C501	CFM, 390pf, ±5%, 500VDCW	C-144
C502	Same as C501	
C503	CFC, 0.04µf, +80-20%, 600VDCW	C-53
C504	CFC, 5000pf, +80-20%, 500VDCW	C-49
C505	Same as C504	
C506	Same as C504	
C507	CFC, 1000pf, GMV, 1000VDCW	C-19
C508	CFC, 50pf, ±10%, 1000VDCW	C-11
C509	CFC, 5pf, ±10%, 1000VDCW	C-4
C510	Same as C509	
C511	CFC, 75pf, ±10%, 1000VDCW	C-12
C512	Same as C503	
C513	CFC, 0.01µf, +80-20%, 500VDCW	C-20
C514	Same as C513	
C515	Same as C507	
C516	CFC, 0.015µf, +80-20%, 500VDCW	C-20
C517	Same as C507	
C518	CFC, 0.02µf, +80-20%, 1000VDCW	C-21
C519	CFCF, 1000pf, 500VDCW	C-39
C520	Same as C519	
C521	Same as C519	
C522	Same as C519	
C523	Same as C519	
C524	Same as C519	
C525	CFC, 125pf	C-14
C526	CFC, 500pf, +80-20%, 500VDCW	C-49
CR501	DSD, IN82	D-1
CR502	Same as CR501	
J501	TC, MX1684/U	J-9
J502	RJ, UG-625/U	J-7
P501	PC, UG-88C/U	J-13
L501	IV, 6-11 mh	L-23

TABLE 5-1 (Cont)

Circuit Reference	Description	Telonic Part No.
L502	IF, 10 mh	L-110
L503	IF, 2.2μh, ±20%	L-100
L504	IF, 1.0μh	L-102
L505	Same as L504	
L506	IF, 5 mh, ±10%	L-115
L507	Same as L502	
L508	Same as L506	
L509	SC	
R501	RFC, 47KΩ, ±10%, 1/2W	R-27
R502	RFC, 1KΩ, ±10%, 1W	R-208
R503	RFC, 68KΩ, ±10%, 1/2W	R-51
R504	RFC, 10KΩ, ±10%, 1/2W	R-23
R505	Same as R504	
R506	RFC, 27KΩ, ±10%, 1/2W	R-25
R507	RFC, 120Ω, ±10%, 1/2W	R-16
R508	Same as R504	
R509	RFC, 33KΩ, ±10%, 1/2W	R-36
R510	Same as R504	
R511	RFC, 270KΩ, ±10%, 1/2W	R-62
R512	RFC, 1MΩ, ±10%, 1/2W	R-31
R513	RFC, 22Ω, ±10%, 1/2W	R-11
V501	TE, 6CB6	VT-6
V502	TE, 12AV7	VT-12
V503	Same as V502	
Y501	QC, 0.1MHz	X-5-0.1 MHz
	MISCELLANEOUS	
	Clip, diode (2 required)	S-9
	Socket, Quartz Crystal	S-18
	Socket, 7-pin	S-7
	Socket, 9-pin (2 required)	S-8
	Shield, 7-pin tube	S-14
	Shield, 9-pin tube (2 required)	S-13
	Plug, wafer (2 required)	S-12
	Socket (mating socket for wafer plugs) (2 required) (not supplied)	S-11

ABBREVIATION CODE

CFC	Capacitor, fixed, ceramic
CFCF	Capacitor, fixed, ceramic feedthru
CFM	Capacitor, fixed, Mylar
DSD	Diode, semiconductor device
IF	Inductor, fixed
IV	Inductor, variable
PC	Plug, cable
QC	Quartz, crystal
RFC	Resistor, fixed, composition
RJ	Receptacle, jack
SC	Subject to change
TC	Terminator, cable
TE	Tube, electron